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METHOD AND DEVICE FOR MANUFACTURING CAST CONCRETE BLOCKS WITH UNDERCUTS

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[Abstract]

The invention pertains to a method and a device for manufacturing cast concrete blocks with undercuts that are directed into the block interior. The cast concrete blocks are manufactured in mold cavities that are delimited by a fabrication base, contour plates that delimit the mold cavities laterally, and a tamping plate that can be moved relative to the fabrication base. In this case, at least the parts of the contour plates that face the regions of the undercuts of the cast concrete blocks are realized in a divided fashion and comprise a fixed contour plate section that serves to guide the tamping plates and a pivotable contour plate section that serves to produce the undercuts.

The pivotable contour plate section has the outer contour of the undercuts that are to be produced. The pivotable contour plate section can be pivoted between a molding position, in which it is pivoted into the respective mold cavity and its surface defines the undercut, and a removal position, in which it is pivoted out of the mold cavity and allows the removal of the cast concrete block from the mold.

Description

The invention pertains to a method and a device for manufacturing cast concrete blocks with undercuts that are directed into the block interior, wherein said concrete blocks are manufactured in mold cavities with a fabrication base, a tamping plate that can be moved relative to the mold bottom, and contour plates that delimit the mold cavities laterally and form the inner part of the device.

A method and a device of this type are known.

The devices for manufacturing cast concrete blocks usually consist of three parts, namely the inner part with the contour plates which defines the basic shape of the block, a frame for accommodating the inner part, and the die set that shapes the upper surface of the blocks in connection with the tamping plates mounted thereon.

When manufacturing cast concrete blocks, the inner part of the mold with the frame and the die set are mounted in a manufacturing machine. The inner part of the mold lies on a fabrication base that forms the mold bottom and on which the finished molded blocks or bricks are subsequently transported. The die set is suspended in a corresponding receptacle device of the manufacturing machine.

The manufacturing process is carried out in such a way that a filling cart for filling the mold cavities with concrete travels between the initially raised die set and the inner mold part that stands on the fabrication base. After the respective mold cavities are filled, the die set is lowered onto the concrete, and the concrete is compacted by subjecting the fabrication base to vibrations. Once the final compaction has taken place, the inner mold part is moved over the tamping plates of the locked die set and the respective parts of the molded are removed from the finished block. The die set is not raised until this process has taken place, and the cast concrete blocks move outward underneath the inner mold part together with the fabrication base.

DE 44 04 621 A1 describes a mold for manufacturing cast concrete blocks with undercuts. The mold contains mold cavities that are delimited by side walls, wherein the side walls are essentially arranged vertically and can be displaced laterally. Displacement of the side walls is achieved by means of a mechanism that comprises two sliding devices in order to remove the finished cast concrete blocks from the mold by displacing the respective side walls of the mold cavities in opposite directions.

DE-PS 25 30 098 describes a device for manufacturing cast raised curbstones, in which a mold wall that is supported in a tiltable fashion in its lower region can be tilted from a first mold position for introducing coarse concrete, to a second mold position for introducing facing concrete by means of a coupled hydraulic cylinder. An elastic cushioning element is vulcanized between the hydraulic cylinder and the mold wall such that the bottom surface of the tiltable mold wall always remains in contact with its base, and no concrete can escape from the mold. Since the mold parts were until now typically removed in the vertical direction, it was only possible to realize undercuts which were directed outward relative to the cast concrete block without relatively large expenditures.

The disadvantage of conventional molds can be seen in the fact that a relatively high equipment expense is required in order to remove concrete blocks with undercuts that are directed into the block interior from the mold, because all the side walls of the mold cavity must be laterally displaced enough that the parts of the side walls forming the undercuts no longer form an obstruction during the removal of the block from the mold. Alternatively, separate hydraulic devices need to be provided in order to at least retract the parts of the side walls that form the undercuts.

Consequently, the invention is based on the objective of developing a method and a device for manufacturing cast concrete blocks which make it possible to manufacture cast concrete blocks with undercuts of various geometry that extend into the block interior, wherein the devices that form the undercuts can be easily placed into the mold with a low equipment expense, namely without requiring additional hydraulic devices, and wherein the cast concrete blocks can be easily removed from the mold.

This objective is attained with a device with the characteristics of Claim 1 and a method with the characteristics of Claim 11. Practical additional developments are disclosed in the respective dependent claims.

Depending on the required type and number of undercuts per block, pivoted longitudinal and/or transverse walls are provided in the inner mold part. These pivoted walls are rotatably supported on the upper side of the inner mold part. Depending on the pivoting range, this can be realized by means of pivot bearings or elastic elements, for example, rubber bearings. Due to the pivotable support of these longitudinal or transverse walls, the lateral pressure of the block and the tamping plate during removal of the block causes the respective walls to pivot outward such that the block can be easily removed from the mold.

The device according to the invention for manufacturing cast concrete blocks with undercuts comprises one or more mold cavities that are delimited by a fabrication base, contour plates that laterally delimit the mold cavities, and a tamping plate that can be moved relative to the fabrication base. According to the invention, at least the contour plates that face the sides of the

cast concrete blocks on which the undercuts need to be produced are realized in a divided fashion, and comprise a fixed contour plate section that serves to guide the tamping plate and a pivotable contour plate section for producing the undercuts. The pivotable contour plate section can be pivoted between a molding position, in which it is pivoted into the respective mold cavity and defines the undercut, and a removal position, in which it is pivoted out of the mold cavity and allows removal of the cast concrete block from the mold.

After the block is removed from the mold or the mold parts are removed from the block, the inner mold part is lowered toward the fabrication base in order to manufacture the next block unit. Corresponding elements, for example, rollers, levers, or wedges, are provided which are pressed out of the mold in the direction of the mold underside when the block is removed from the mold. When the inner mold part is placed on the fabrication base, these elements are displaced in the direction of the mold. During this process, they pivot the rotatable longitudinal or transverse walls back into the initial position of the block undercut.

One significant advantage of the device according to the invention can be seen in the fact that it is no longer necessary to move the entire contour plate away from the mold cavity in order to remove the block from the mold. According to the invention, only the part of the contour plate that serves to produce the undercut in the cast concrete block needs to be moved out of the cavity that represents the undercut. Consequently, the cast concrete block can be easily removed from the mold cavity. This means that the masses to be moved are reduced, and that the part of the contour plate which serves to produce the undercuts and is supported in a pivoted fashion can be easily exchanged if the geometric shape of the undercuts needs to be varied. No other components of the device have to be exchanged if a different block geometry needs to be manufactured. This significantly increases the flexibility in comparison with known devices, and removal of the block from the mold is not only simplified but also accelerated, such that an overall increase in productivity is achieved.

According to one preferred embodiment of the invention, the pivotable contour plate sections of one respective side of the mold cavities are connected to a first lever on a common axis of rotation. Since the device for manufacturing cast concrete blocks preferably consists of a relatively large number of mold cavities, it is required to provide a corresponding number of pivotable contour plate sections. This is why the pivotable contour plate sections are arranged on a shaft, by means of which they can be synchronously pivoted about the axis of rotation extending through the shaft.

According to another preferred embodiment, the removal position of the pivotable contour plate section is defined by a limit stop arranged in an intermediate space between the mold cavities. The limit stop is preferably realized in the form of a continuous rail that extends into the

intermediate space such that the contour plate sections of all mold cavities are pivoted into the same removal position.

According to another preferred embodiment, the device for ensuring the pivoting motion of the pivotable contour plate section into the removal position can be raised relative to the fixed contour plate section. When the device is raised, a sufficient clearance is provided for pivoting or automatically pivoting the pivotable contour plate section in the direction of the intermediate space such that the parts of the pivotable contour plate section which produce the undercuts in the cast concrete blocks are pivoted out of the mold cavity region and consequently away from the cast concrete block.

According to another preferred embodiment, a second lever is supported on the fabrication base by means of a cam roller or a shoe and held against the limit stop in the removal position by means of a first return spring. Due to this measure, the pivotable contour plate section can be pivoted from the molding position into the removal position and vice versa by respectively lowering and raising the device.* This second lever is preferably also seated on a shaft that extends in the intermediate space between the mold cavities in order to achieve a uniform force transmission via the fabrication base of the device. The fabrication base with the remaining parts of the device for manufacturing cast concrete blocks is preferably acted upon by a spring device such that the second lever is able to return into its initial position when it is pivoted back in order to disengage from the fabrication base.

According to another preferred embodiment, the pivotable contour plate sections are connected to the limit stop by means of a second return spring, and the pivotable contour plate section is held in the molding position with a pressing roller that is situated on the end of the first lever that faces the pivotable contour plate section. When the first lever is pivoted back, the second return spring pulls the pivotable contour plate section back into the removal position.

According to another preferred embodiment, the axis of rotation of the first lever can be displaced in a slide rail, wherein the direction of displacement in the slide rail is adapted such that the pivotable contour plate section can be moved from the molding position into the removal position. Such a sliding rail mechanism has the advantage that a matching between the movement of the mold bottom and the movement of the pivotable contour plate section can be realized relatively easily.

According to another preferred embodiment, the fabrication base cooperates with a movable block that fixes the pivotable contour plate section in the molding position and moves this pivotable contour plate section into the removal position. The block is preferably realized in a

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* [Editor's note: The invention applies to either lifting the mold off the blocks or to dropping the blocks out of the mold, causing considerable ambiquity in the descriptions as to what "the device" comprises, what is moving and what is fixed, etc.]

wedge-shaped fashion, wherein the wedge angle corresponds to the slope that the pivotable contour plate section assumes in case of obliquely extending undercuts. In differently shaped undercuts, the side of the block that faces the pivotable contour plate is correspondingly adapted to the surface shape of this contour plate section.

According to another preferred embodiment, the first levers for the pivotable contour plate sections are arranged in the intermediate space between the mold cavities in a mirror-symmetric fashion, namely on one respective axis of rotation. This means that the intermediate space is utilized for simultaneously "operating" respectively opposing mold cavities from one intermediate space. The mirror-symmetric arrangement provides the advantage that only one drive with a corresponding motion reversing gear is required for both shafts.

According to another preferred embodiment, the first levers for the pivotable contour plate sections and the second levers for lowering the mold bottom are seated on a shaft that can be rotated about the axis of rotation. If the first levers as well as the second levers are seated on a common shaft, it is possible to achieve a completely synchronous movement of the pivotable contour plate sections and the mold bottom.

The invention also pertains to a method for manufacturing cast concrete blocks with undercuts that are directed into their interior, wherein said concrete blocks are pressed in mold cavities that are formed by a fabrication base, a tamping plate that can be moved relative to the fabrication base, and contour plates that define the outer shape of the cast concrete block and are divided at least in the region of the undercuts. According to the invention, this method comprises the following steps: the pivotable contour plate sections that define the undercuts in the cast concrete blocks are initially pivoted into the mold cavity, namely from a removal position into a molding position. In this case, the pivotable contour plate sections together with fixed contour plate sections that are arranged above the pivotable contour plate sections form a closed surface at least on the side that faces the mold cavity. Before the mold cavities are filled with concrete, the device is lowered in the direction of the fabrication base until the fabrication base contacts the underside of the contour plate sections and a mold that is closed in the direction of the interior of the mold cavities is formed. The guided tamping plate is then lowered in the direction of the interior of the mold cavities in order to provide the cast concrete blocks with a smooth surface.

One significant advantage of the method according to the invention is that the pivotable contour plate sections make it possible to prevent the high equipment expense required in known methods, in which all the contour plates need to be linearly displaced.

According to one preferred embodiment of the invention, the pivoting of the pivotable contour plate sections and the lowering of the device toward the fabrication plate take place synchronously.

According to yet another preferred embodiment, the tamping plate is locked when the block is removed from the mold, the device is lifted off the fabrication base and the pivotable contour plate sections are pivoted from the molding position into the removal position outside the mold cavities, or are automatically pivoted in this fashion due to the lateral pressure of the cast concrete blocks, i.e., the steps of the method according to the invention are carried out in the reverse sequence.

Other advantages, characteristics and optional applications of the present invention are described in greater detail below with reference to embodiments that are illustrated in the attached figures.

The figures show:

Figure 1, a top view of the device according to the invention;

Figure 2, a detailed representation of two mold cavities of the device according to Figure 1;

Figure 3, the pivoting mechanism for a pivotable contour plate, in the removal position while the inner mold part is raised;

Figure 4, the pivoting mechanism according to Figure 3 in the molding position;

Figure 5, a mechanism for a pivotable contour plate while the inner mold part is raised in order to remove the cast concrete block from the mold;

Figure 6, the mechanism according to Figure 5 in the molding position while the inner mold part is lowered;

Figure 7, a mechanism analogous to that shown in Figure 5 in the removal position, wherein said mechanism is, however, provided with a shoe instead of a cam roller;

Figure 8, a mechanism according to Figure 5 with a pivot shaft of circular cross section in the removal position;

Figure 9, another embodiment of a pivoting mechanism for the pivotable contour plate section, with a pivot shaft with a stationary axis of rotation;

Figure 10, another embodiment of a mechanism that is realized similarly to that shown in Figure 9, namely with a pivot shaft that is guided in a slide rail;

Figure 11, another embodiment of a pivoting mechanism for the pivotable contour plate section in the removal position, in the form of a movable block that is guided in a slide rail by means of a mounting bolt;

Figure 12, the movable block according to Figure 11 in the molding position;

Figure 13, another embodiment of a pivoting mechanism for a contour plate section, in the removal position that serves to produce an angular undercut with a rounding;

Figure 14, the movable contour plate section according to Figure 13 in the molding position;

Figure 15, the arrangement of a mirror-symmetric pivoting mechanism with square pivot shaft in an intermediate space between mold cavities, in the molding position (solid line) and in the removal position (dot-dash line), and

Figure 16, the mirror-symmetric arrangement of the pivoting levers for lowering the mold bottom on a round shaft in the intermediate space between the mold cavities, in the molding position (solid line) and in the form of its movement until the removal position is reached (dotted lines).

Figure 1 shows a top view of a device according to the invention with three rows of mold cavities 5, wherein each row respectively comprises five successively arranged mold cavities. The mold cavities 5 are laterally delimited by contour plates 2, 3, 4, wherein the contour plates 2, 3, 4 are seated on a fabrication base that forms the bottom end of the mold cavities 5. Intermediate spaces for accommodating mechanisms for moving at least part of the contour plates are provided between the individual rows of mold cavities 5. The contour plates 3, 4 are divided and comprise a fixed contour plate section 3 and a pivotable contour plate section 4. The pivotable contour plate section 4 serves to produce corresponding undercuts in the cast concrete blocks. The mechanisms for pivoting the pivotable contour plate sections are respectively arranged in the intermediate spaces between the mold cavities on a continuous shaft, wherein the pivoting mechanisms of the contour plates for one side of the mold cavities and the pivoting mechanisms for the opposite side are arranged mirror-symmetric to one another in the intermediate space.

Accordingly, only one continuous shaft for the pivoting mechanisms of the pivotable contour plate sections is provided for the mold cavities 5 arranged on the edge of the entire device. Lever devices are situated on the respective sides of the device on the respective continuous shafts 19, 22. One side of these levers is arranged on a continuous shaft 19, 22, and their opposite side carries a cam roller 13 or a shoe 14, by means of which the lever mechanism realized in the form of a second lever 11 is supported on the fabrication base 1. This means that the first levers 7 for pivoting the pivotable contour plate sections 4 and the second levers 11 that are actuated by the lifting movement of the entire device relative to the fabrication base 1 are arranged on a continuous shaft 19, 22. When the pivot shaft is actuated, i.e., when it is rotated about the axis of rotation 8, the pivotable contour plate sections 4 and the entire device are simultaneously actuated such that sufficient free space for pivoting back the pivotable contour plate sections 4 is created when the device is lifted off the fabrication base 1. The cast concrete blocks can be easily removed from the mold cavities 5 in the respective end positions of the described movements of the mold bottom and the pivotable contour plate sections 4.

Figure 2 shows a detailed representation of the two mold cavities 5 of the device according to Figure 1. The mold cavities are laterally delimited by a lateral contour plate 2 and by a divided contour plate 3, 4, with the bottom of the mold cavities being delimited by the fabrication base 1

that is not separately identified in Figure 2. When the continuous shaft 19, 22 is rotated about the axis of rotation 8, the first levers 7 for pivoting the pivotable contour plate sections 4 as well as the second levers 11 for lifting the device 1 [sic] off the fabrication base 1 are simultaneously actuated. In this case, the second levers 11 are lowered by the cam roller 13 or the shoe 14 enough that the pivotable contour plate section 4 that defines the undercut 20 can be pivoted out of the mold cavity 5 by the first levers 7, specifically by an angle of rotation such that the finished concrete block can be easily removed from the mold.

Figure 3 shows a section through part of a mold cavity 5 and part of an intermediate space 9 formed between the mold cavities of the device according to the invention. The pivoting mechanism for the pivotable contour plate section 4 is shown in the removal position, in which it is pivoted back to such a degree that the first lever 7 which carries the pivotable contour plate section 4 abuts with its rear side a limit stop 10 provided in the intermediate space 9. The first lever 7 is seated on a square shaft 19 that can be pivoted about the axis of rotation 8 in order to transmit the pivoting movement. The limit stop 10 is rigidly fixed on the underside of the mold. The device is lifted off the fabrication base 1 in order to pivot the first lever 7, shown together with the pivotable contour plate section 4 back into the removal position. In this case, the pivoting movement is realized by means of a second lever 11, not illustrated in Figure 3, that is also seated on the square shaft 19 such that it is moved synchronously with the pivoting movement of the pivotable contour plate sections 4.

The pivotable contour plate section 4 shown serves to produce an undercut of triangular cross section. Lateral delimitation of the mold cavity 5 in the upper region above the pivotable contour plate section 4 is realized in the form of a fixed contour plate section 4 [sic; 3]. A tamping plate 6 can be lowered into the mold cavity 5. Lowering of the tamping plate 6 serves to achieve, if so required, a certain compaction of the concrete that is still elastic when it is introduced into the mold cavity, as well as to provide the cast concrete block with a smooth surface. The intermediate space 9, in which the first lever 7 is arranged in a pivoted fashion on the square shaft 19, is covered, on its opposite side relative to the fabrication base 1, with a table sheet 21 such that contamination of the pivoting mechanism is largely precluded.

Figure 4 shows the pivoting mechanism according to Figure 3 in the molding position. In this position, the pivotable contour plate 4 is pivoted into the mold cavity 5 by rotating the shaft 19 about the axis of rotation 8 to the degree that the upper end surface of the pivotable contour plate section 4 snugly adjoins the lower end surface of the fixed contour plate section 3. In the molding position shown, the upper surface of the fabrication base 1 snugly adjoins the lower end surface of the pivotable contour plate section 4. This means that a closed surface is formed in the mold cavity 5 and that the elastic concrete introduced into the mold cavity 5 cannot escape from the mold. An elastic sealing and damping element 28 is arranged on the lower end surface of the fixed contour

plate section in order to prevent concrete residue deposited on the adjoining end surfaces from causing leaks between the fixed contour plate section and the pivotable contour plate section 4.

Figure 5 shows the second lever 11 that is seated on the square shaft 19 and serves to actuate the lever 7. The second lever 11 can be pivoted about the axis of rotation 8 together with the square shaft 19 between the removal position shown in Figure 5 and a molding position. In the removal position shown, a rear stopping surface of the second lever 11 adbuts the limit stop 10 that extends through the intermediate space 9 between the mold cavities 5 in the form of a continuous rail. The second lever 11 is provided with a cam roller 13 on its front end that faces away from the limit stop 10. This cam roller 13 is supported on the fabrication base 1 such that the square shaft 19 is rotated about the axis of rotation 8 when the device is raised and the second lever 11 exerts a downward pressure upon the fabrication base 1, wherein the cam roller 13 rolls on the surface that faces the mold cavity 5. In order to hold the second lever 11 in the removal position, a return spring 12 is arranged on the second lever 11 and pulls said lever against the limit stop 10. The lowering mechanism formed by the second lever 11 is also covered with the table sheet 21 in order to prevent contamination and other damage.

Figure 6 shows the design of the lever mechanism that is formed by the second lever 11 and serves for the support on the fabrication base 1 in the molding position. In this molding position, the front end of the second lever 11 that carries the cam roller 13 is pivoted upward by rotation of the square shaft 19 about the axis of rotation 8 in the clockwise direction, such that a seal is produced relative to the pivotable contour plate section 4 shown in Figure 4. Since the return spring 12 is arranged underneath the axis of rotation 8, the fabrication base 1 needs to be held in the molding position by the lowered device.

Figure 7 shows a pivoting mechanism realized similar to that described above with reference to Figure 5, wherein this pivoting mechanism is, however, provided with a shoe 14 instead of the above-described cam roller 13. The shoe 14 is mounted on the front end of the second lever 11 and adjoins with its long side the inner surface of the fabrication base 1 that faces the mold cavity 5. When the square shaft 19 is rotated about the axis of rotation 8 such that the second lever 11 is pivoted from the molding position into the removal position and its rear stopping surface abuts the limit stop 10 arranged in the intermediate space 9, the shoe 14 remains in contact with the inner surface of the fabrication base 1 that faces the mold cavities 5 and slides on the surface of the fabrication base 1 when the device is raised. The shoe 14 is preferably manufactured from a material that has low friction relative to the surface of the fabrication base 1.

Figure 8 shows another embodiment of a mechanism for actuating the pivotable contour plate. The basic design of the lever mechanism formed by the second lever 11 merely differs from that described above with reference to Figure 5 in that a round shaft 22 is provided instead of the square shaft 19. In order to achieve a reliable power transmission between the round shaft 22 that

can be rotated about the axis of rotation 8 and the second lever 11, a force fit connection is provided between the second lever 11 and the round shaft 22. This force fit connection can be conventionally produced by shrinking the second lever 11 onto the round shaft 22, by fixing a slotted lever head on the round shaft 22 by means of screws, or by other conventional mounting methods available to a person skilled in the art. The basic design of the lever mechanism with the second lever 11 corresponds to the design described above with reference to Figure 5.

Figure 9 shows another embodiment of a mechanism for pivoting the pivotable contour plate section 4 between a molding position and a removal position. A round shaft 22 that can be rotated about an axis of rotation 8 carries the first lever 7 that, in turn, carries a pressing roller 16 on its front end. In the molding position, this pressing roller presses against the rear side of the pivotable contour plate section 4 such that the pivotable contour plate section 4 can be held in its defined position required for producing the desired undercut in this molding position. On the rear side of the pivotable contour plate section 4, the lower region of the pivotable contour plate section 4 is connected to the limit stop 10 by means of a return spring 15. The pressing roller is pivoted downward by rotating the round shaft 22 in the counterclockwise direction such that the contour plate section 4 is retracted from the mold cavity 5 under the influence of the return spring 15 as the device is lifted off the fabrication base 1. This pivoting movement of the pressing roller results in a pivoting movement of the pivotable contour plate section 4. The remaining design of the mold and the mold cavity 5 corresponds to the design described so far.

Figure 10 shows another embodiment of a pivoting mechanism for the pivotable contour plate section 4. A round shaft 22 [sic; 23] that can be rotated about an axis of rotation 8 is connected to the first lever 7 that carries a pressing roller 16 on its opposite end relative to the axis of rotation 8. This pressing roller abuts the rear side of the pivotable contour plate section 4 and thusly supports the contour plate section 4 that produces the respective undercut. The lower region of the rear side of the pivotable contour plate section 4 is also provided with a return spring 15 in this case, wherein said return spring is connected to a stationary slide rail that serves as an anchor point in the pulling direction of the spring and that also contains a slot that is essentially aligned vertically relative to the fabrication base 1. The slot in the slide rail 17 serves to vary the vertical position of the round shaft 22 in order to pivot the pivotable contour plate section 4 from the molding position, in which it projects into the mold cavity 5, to the removal position, in which is pivoted out of the mold cavity 5, simultaneously with the counterclockwise pivoting movement of the first lever 7. In this case, the return spring 15 always pulls the pivotable contour plate section 4 that is in contact with the pressing roller 16 into the removal position when the device 1 is raised and the first lever 7 is pivoted.

Figure 11 shows another embodiment of a mechanism for realizing a pivoting movement of the pivotable contour plate section 4. Figure 11 shows this mechanism in the removal position of the pivotable contour plate section 4.

A movable, wedge-shaped block carries a mounting bolt 24 that is guided in a slide rail 25 on at least one side, wherein said block can be displaced from the molding position into the removal position as the mounting bolt 24 is guided in the obliquely arranged slide rail 25. In the removal position, the movable block 18 is pushed back to the degree that the pivotable contour plate section 4 is completely pivoted back while the device is simultaneously raised relative to the fabrication base 1. The pivotable contour plate section 4 is provided with a special pivoted support for this purpose. In order to ensure that the movable block 18 always rests on the inner surface of the fabrication base 1, a compression spring is arranged between the table sheet 21 and the upper side of the movable block 18.

When the movable block 18 is laterally displaced as the device is lowered in the direction of the fabrication base 1, this superimposed movement exactly corresponds to the incline of the slide rail 25 such that the mounting bolt 24 is displaced in the slide rail 25 to its other end, wherein this end position corresponds to the removal [sic; molding] position shown in Figure 12. The slope of the surface of the movable block 18 that faces the rear side of the pivotable contour plate section 4 results in a snug contact such that the movable block 18 holds the pivotable contour plate section 4 in the molding position.

Figures 13 and 14 show other embodiments of a pivotable contour plate section 4 for cast concrete blocks with an undercut of L-shaped cross section, wherein the removal position is shown in Figure 13 and the molding position is shown in Figure 14. A rod assembly 26 that is guided in a slide rail 25 on its upper side and supported on the inner surface of the mold bottom by means of a roller 27 on its lower side is arranged in the intermediate space 9. The rod assembly 26 is connected to the inner side of the pivotable contour plate section 4 by means of a linkage. In the removal position, the bottom end surface of the pivotable contour plate section 4 is seated on the inner surface of the fabrication base 1 that faces the mold cavity 5. The slide rail is obliquely arranged in its guide in the intermediate space 9 such that the roller 27 rolls on the inner surface of the fabrication base 1 and the pivotable contour plate section 4 is raised when the device is lowered in the direction of the fabrication base 1 in the above-described fashion. The rod assembly 26 serves to move the pivotable contour plate section 4 into the molding position in such a way that the short limb of the L-shape abuts the elastic damping element 28 on the lower end surface of the fixed contour plate section 3. This means that a closed inner surface of the mold cavity is formed in the molding position, and a correspondingly-shaped undercut can be produced in the cast concrete block by means of the L-shaped contour plate section 4. The pivoting and guide

mechanism of this embodiment is also arranged in the intermediate space 9 and covered as well as protected from becoming contaminated or otherwise damaged by the table sheet 21.

Figure 15 shows a section through the intermediate space 9, in which two pivot shafts 19 are arranged, wherein each respective pivot shaft carries corresponding first levers 7 that, in turn, carry the pivotable contour plate sections 4 on their front ends. The solid line for the first lever 7 corresponds to the removal [sic; molding] position, and the dot-dash line corresponds to the molding [sic; removal] position. Since the pivoting movements of the pivotable contour plate sections 4 extend in a mirror-symmetric fashion relative to one another, drive of the shafts 19 can be realized with a single drive unit and a corresponding motion reversing gear.

Figure 16 shows the arrangement of the second levers 11 that are seated on each respective round shaft 22 extending in the intermediate space 9. The solid line for the second levers 11 respectively corresponds to the molding position, and the broken lines indicate three selected stages of the movement of the second lever 11 into the removal position when the round shaft 22 is rotated about the axis of rotation 8. The limit stop 10 arranged in the center of the intermediate space 9 serves as a corresponding limit stop for the removal position of the second levers 11 on each side. Also illustrated with broken lines are the fixed contour plate sections 3 as well as the movable contour plate sections 4, namely in three stages of the movement from the molding position to the removal position.

Claims

1. Device for manufacturing cast concrete blocks with undercuts (20) that are directed into their interior, wherein said device comprises one or more mold cavities (5) that are formed by a fabrication base (1), contour plates (2, 3) that laterally delimit the mold cavity (5) and a tamping plate (6) that can be moved relative to the fabrication base (1), characterized by the fact that at least the contour plates (3, 4) that face the undercuts (20) of the cast concrete blocks are realized in a divided fashion and comprise a fixed contour plate section (3) that serves to guide the tamping plate (6) and a pivotable contour plate section (4) that serves to produce the undercuts (20), wherein the pivotable contour plate section (4) can be pivoted between a molding position, in which it is pivoted into the respective mold cavity (5) and defines the undercut (20), and a removal position, in which it is pivoted out of the mold cavity (5) and allows the removal of the cast concrete block from the mold.

2. Device according to Claim 1, characterized by the fact that the pivotable contour plate section (4) of one respective side of the mold cavities (5) is connected to a first lever (7) on a common axis of rotation (8).

3. Device according to Claim 1, characterized by the fact that the removal position of the pivotable contour plate section (4) is defined by a limit stop (10) that is arranged in an intermediate space (9) between the mold cavities (5).

4. Device according to one of Claims 1-3, characterized by the fact that the device can be lowered in the direction of the fabrication base (1) in order to pivot the pivotable contour plate section (4) into the removal [sic] position relative to the fixed contour plate section (3).

5. Device according to Claim 4, characterized by the fact that a second lever (11) is supported on the fabrication base (1) by means of a cam roller (13) or a shoe (14) and held on the limit stop (10) in the removal position by means of a first return spring (12), such that the pivotable contour plate section (4) is pivoted from the molding position into the removal position and vice versa by respectively lowering and raising the device relative to the fabrication base (1).

6. Device according to Claim 3, characterized by the fact that the pivotable contour plate section (4) is connected to the limit stop (10) by means of a second return spring (15), and by the fact that the pivotable contour plate section (4) in the molding position by means of a pressing roller (16) that is arranged on the end of the first lever (7) that faces the pivotable contour plate section, wherein the second return spring (15) pulls the pivotable contour plate section (4) into the removal position when the first lever (7) is pivoted back.

7. Device according to Claim 3 or 6, characterized by the fact that the axis of rotation (8) of the first lever (7) can be displaced in a slide rail (17), wherein the direction of displacement is adapted in such a way that the pivotable contour plate section (4) can be moved from the molding position into the removal position.

8. Device according to Claim 1, characterized by the fact that a block (18) is provided that can be moved on the fabrication base (1), wherein this block fixes the pivotable contour plate section (4) in the molding position and moves said pivotable contour plate section into the removal position.

9. Device according to one of Claims 3-7, characterized by the fact that the respective first levers (7) for the pivotable contour plate sections (4) are arranged in a mirror-symmetric fashion relative to one another on one respective shaft (19, 22) in the intermediate space (9) between the mold cavities (5).

10. Device according to Claims 2 and 5, characterized by the fact that the first levers (7) and the second levers (11) are seated on a shaft (19, 22) that can be pivoted about the axis of rotation (8).

11. Method for manufacturing cast concrete blocks with undercuts that are directed into their interior, wherein said concrete blocks are cast in mold cavities, wherein the mold cavities are formed by a fabrication base (1), a tamping plate that can be moved relative to the fabrication base

(1), and contour plates that define the outer shape of the cast concrete block and are divided at least in the region of the undercuts, with said method comprising the following steps:

a) pivoting the pivotable contour plate sections that define the undercuts from a removal position into a molding position in the mold cavity, wherein the pivotable contour plate sections together with fixed contour plate sections form a closed surface, at least on the side that faces the mold cavity, in the molding position;

b) lowering the device in the direction of the fabrication base (1) until the fabrication base contacts the lower end surface of the contour plate sections;

c) filling the mold cavities with elastic concrete, and

d) lowering a tamping plate into the mold cavities.

12. Method according to Claim 11, characterized by the fact that the inward pivoting of the pivotable contour plate sections and the lowering of the device in the direction of the mold bottom take place synchronously.

13. Method according to Claim 11 or 12, characterized by the fact that, when removing the block from the mold, the tamping plate is locked, the device is raised, and the pivotable contour plate sections are pivoted from the molding position into the removal position outside the mold cavities.

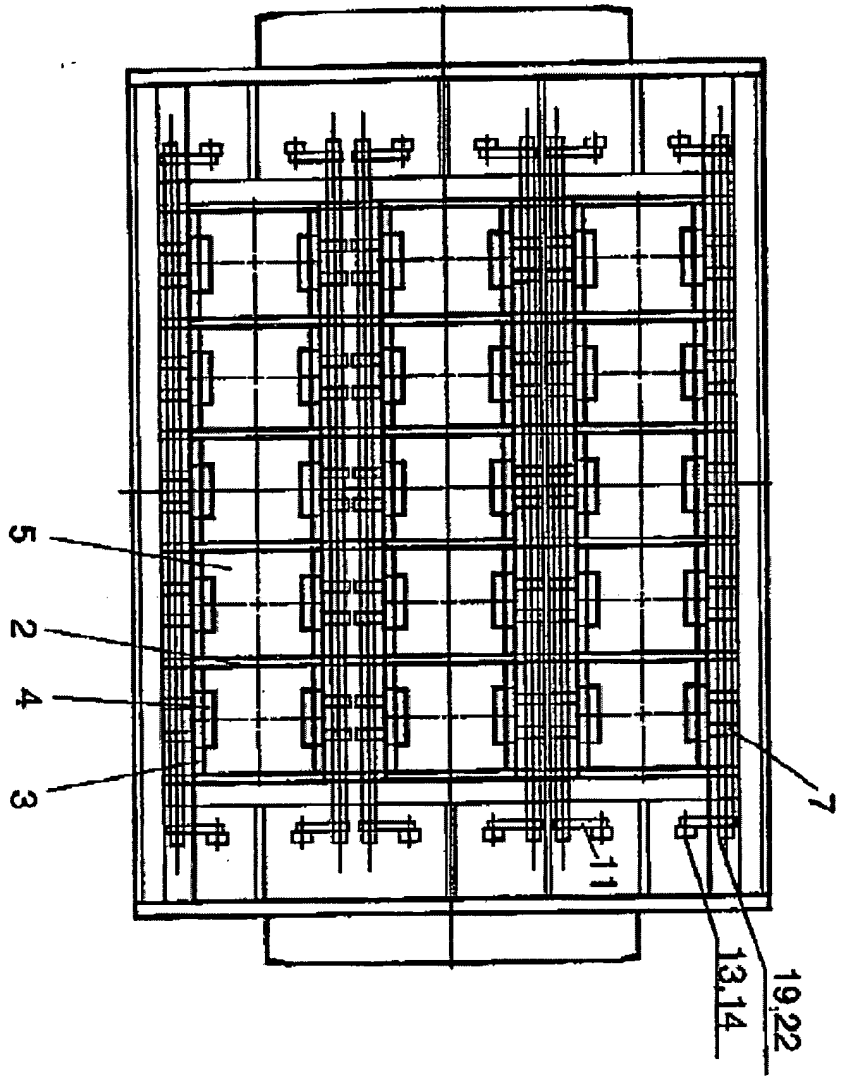

Fig. 1

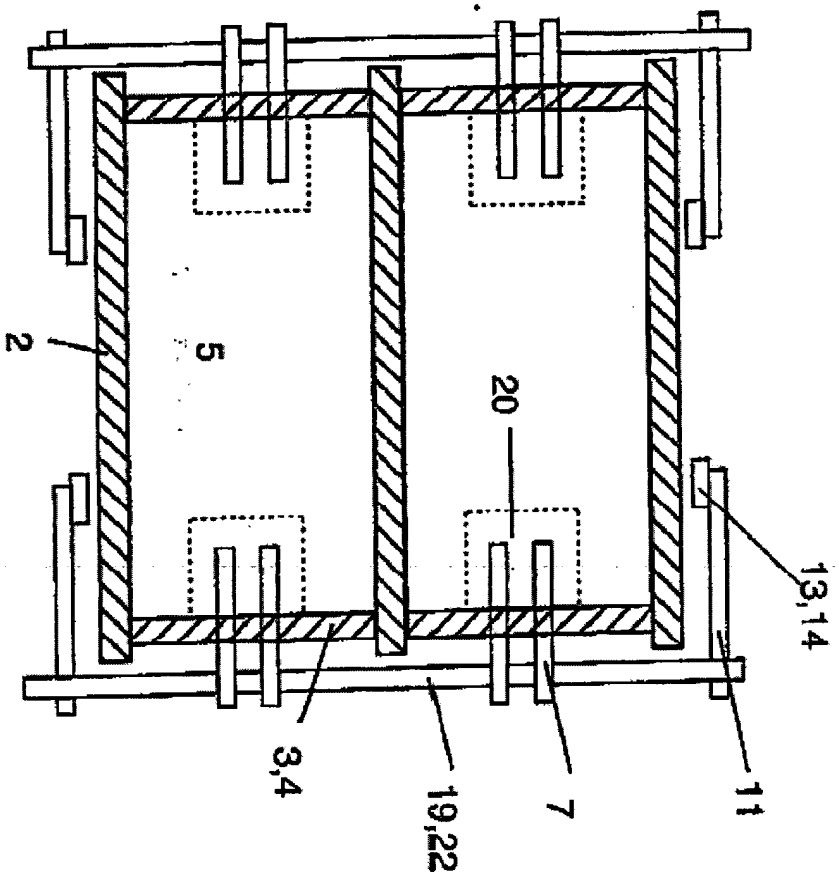

Fig.2

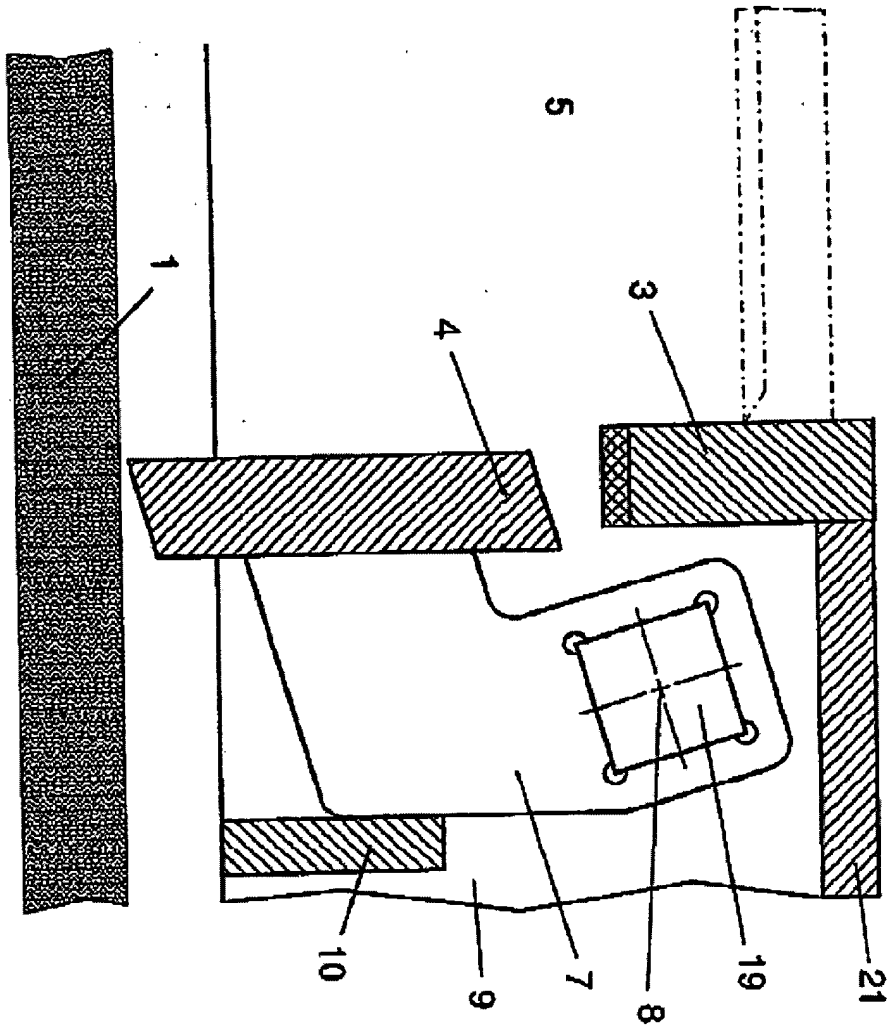

Fig. 3

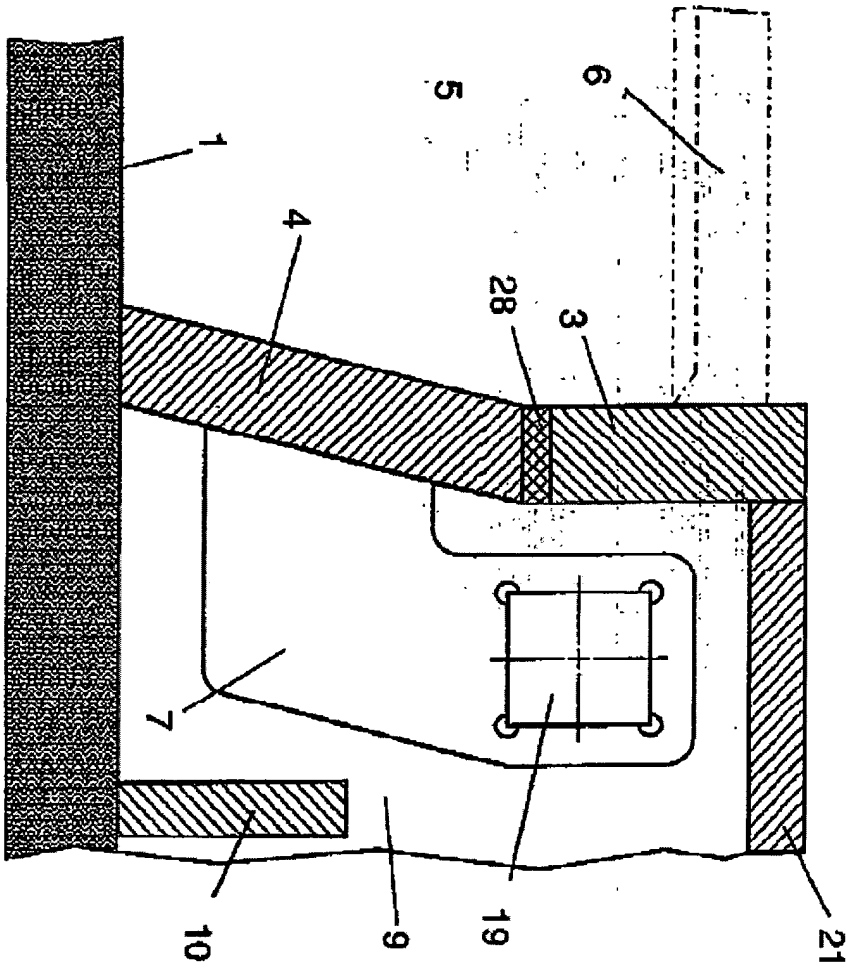

Fig. 4

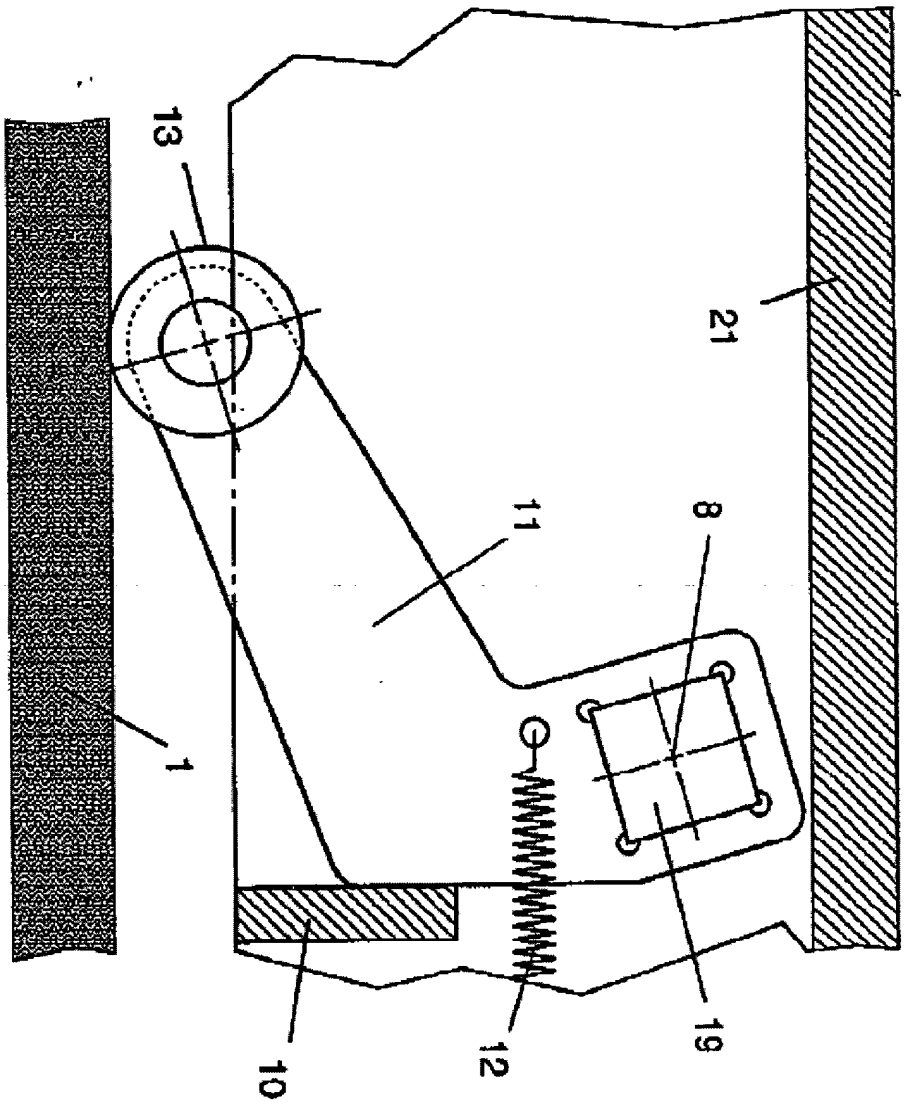

Fig. 5

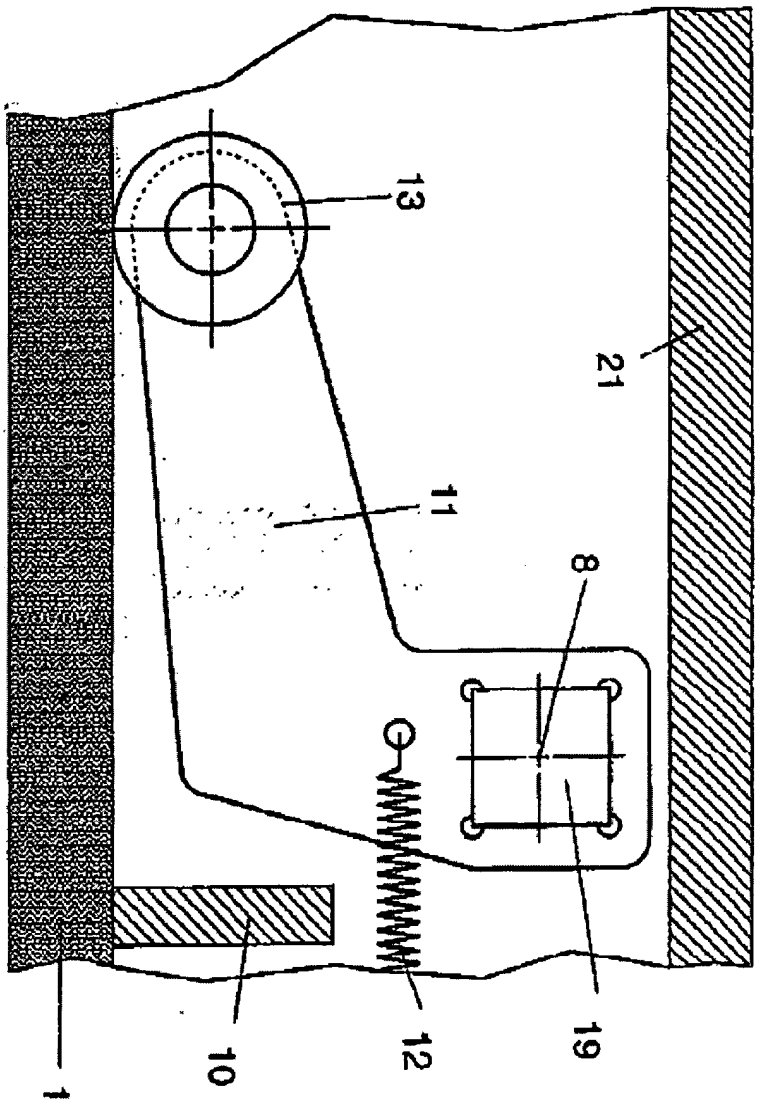

Fig. 6

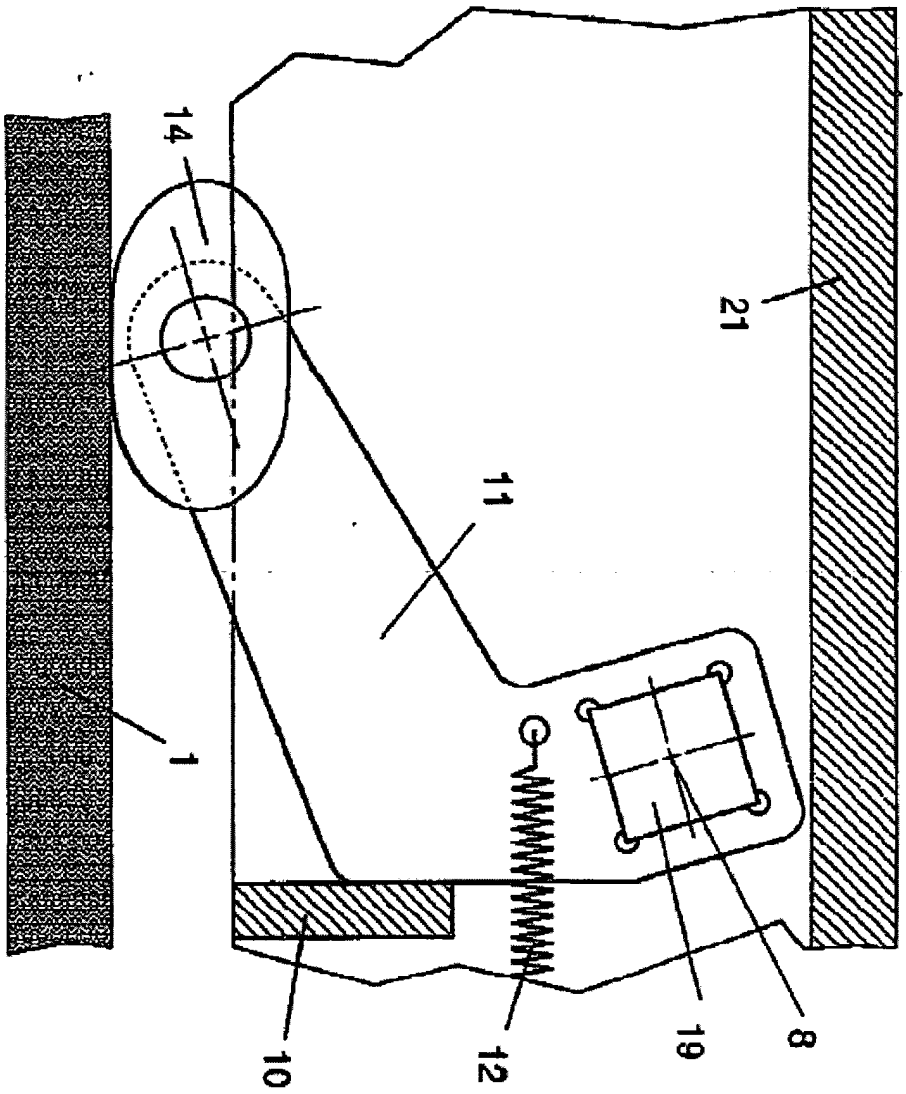

Fig. 7

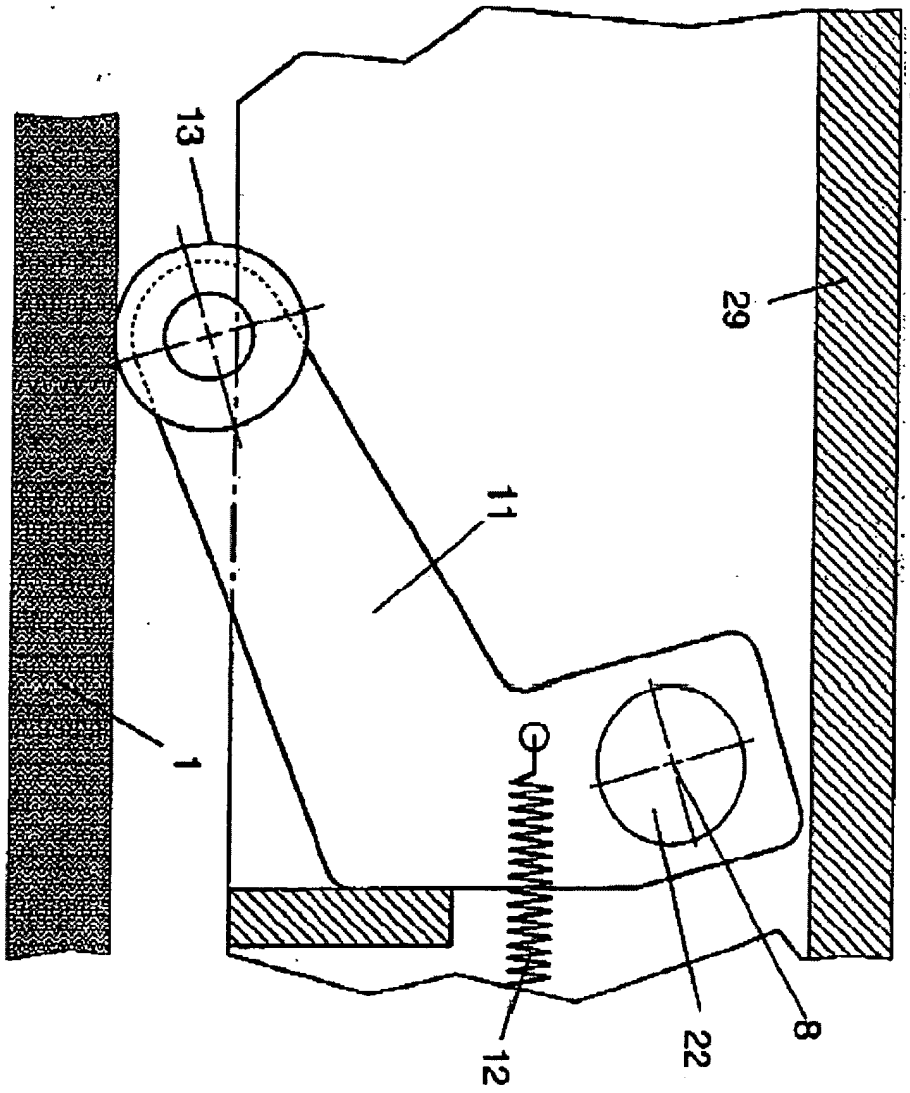

Fig. 8

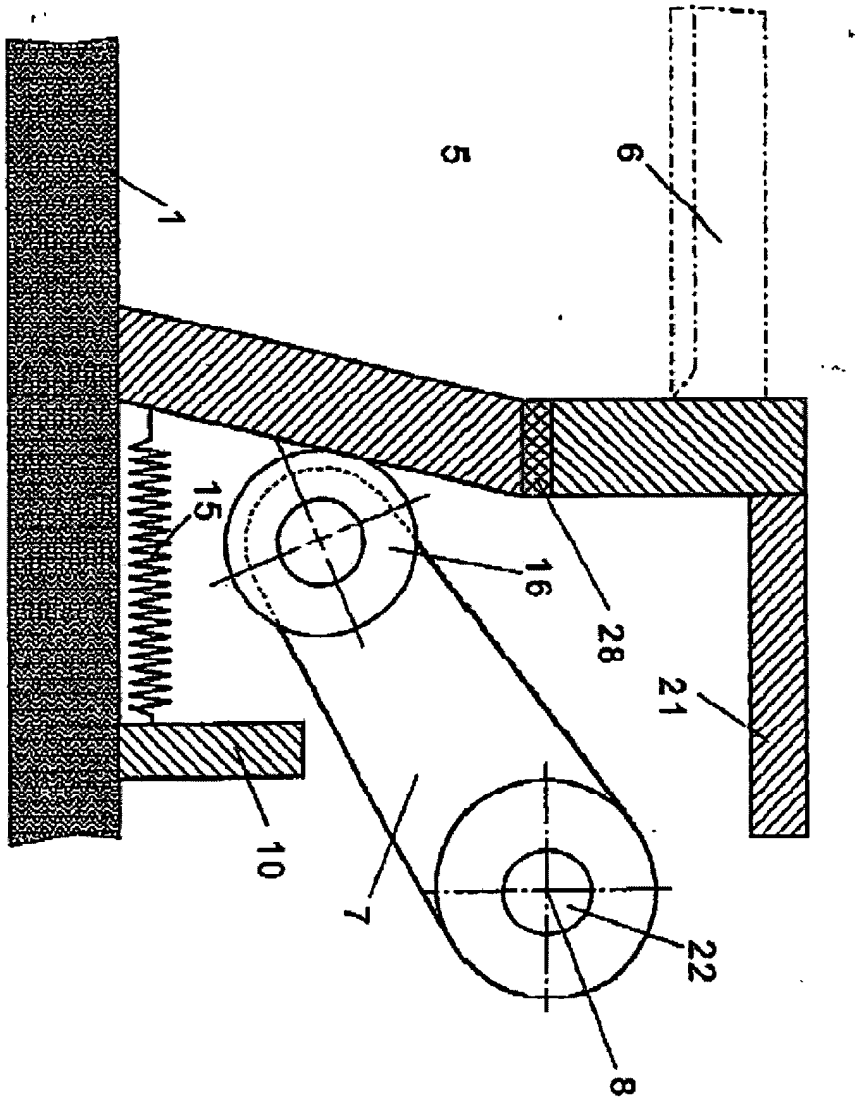

Fig. 9

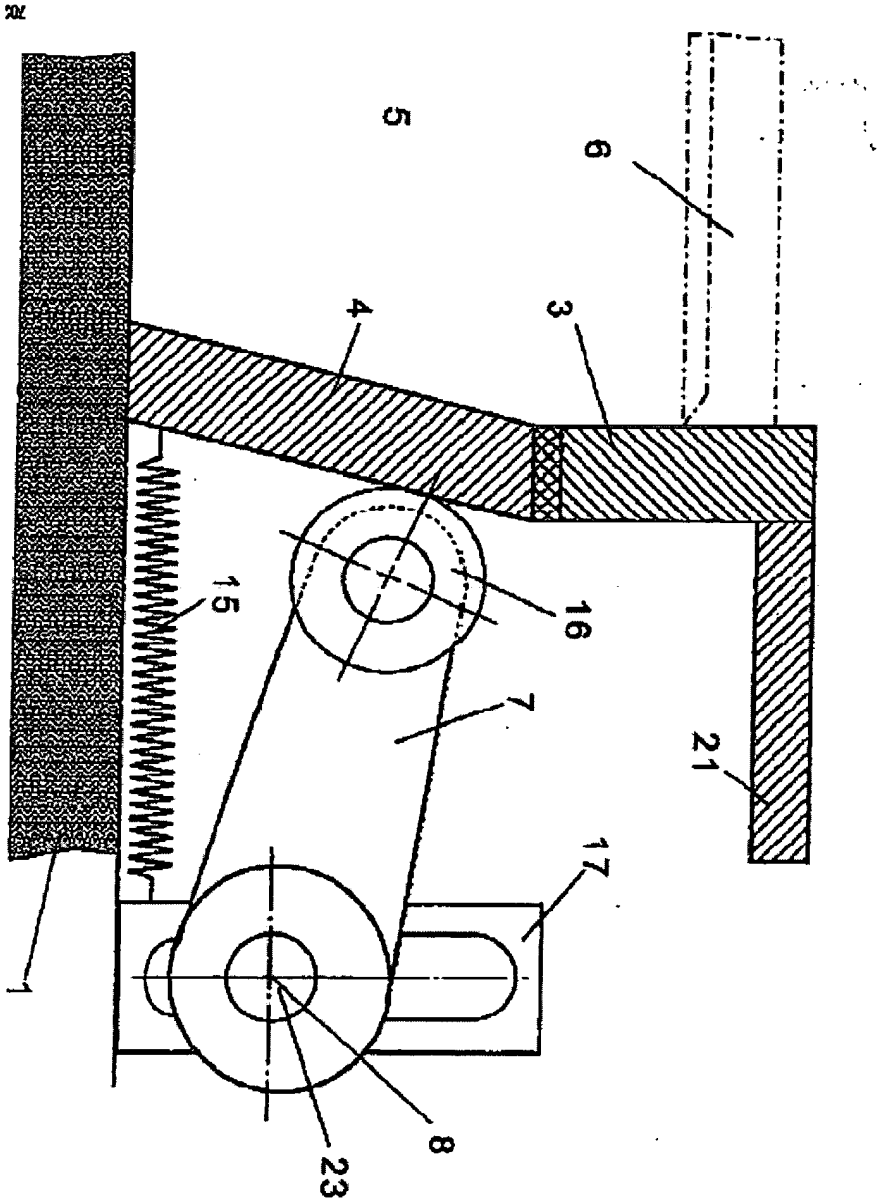

Fig. 10

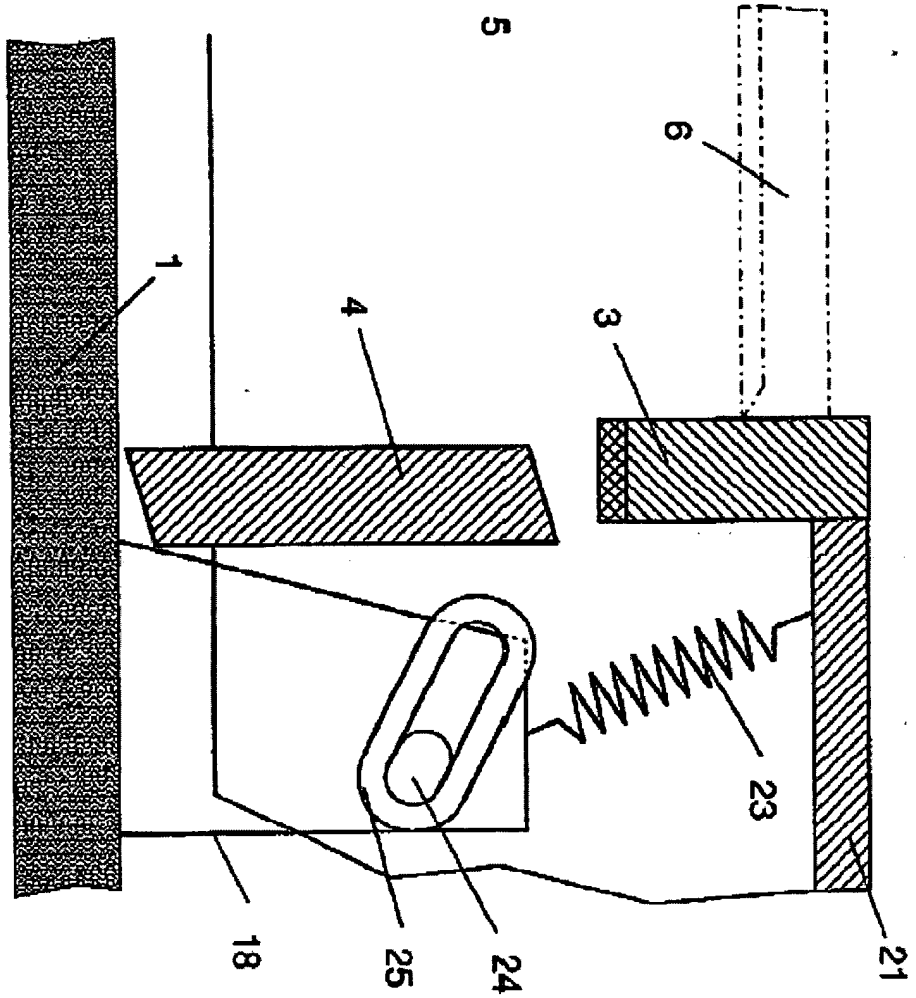

Fig. 11

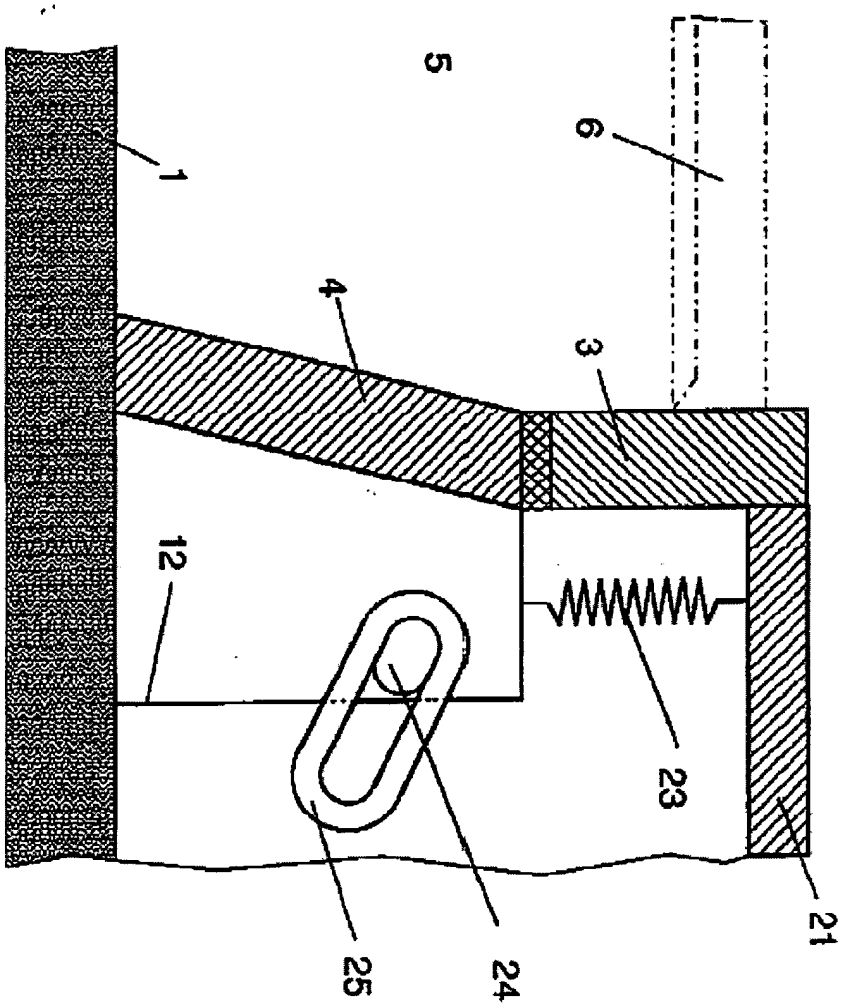

Fig. 12

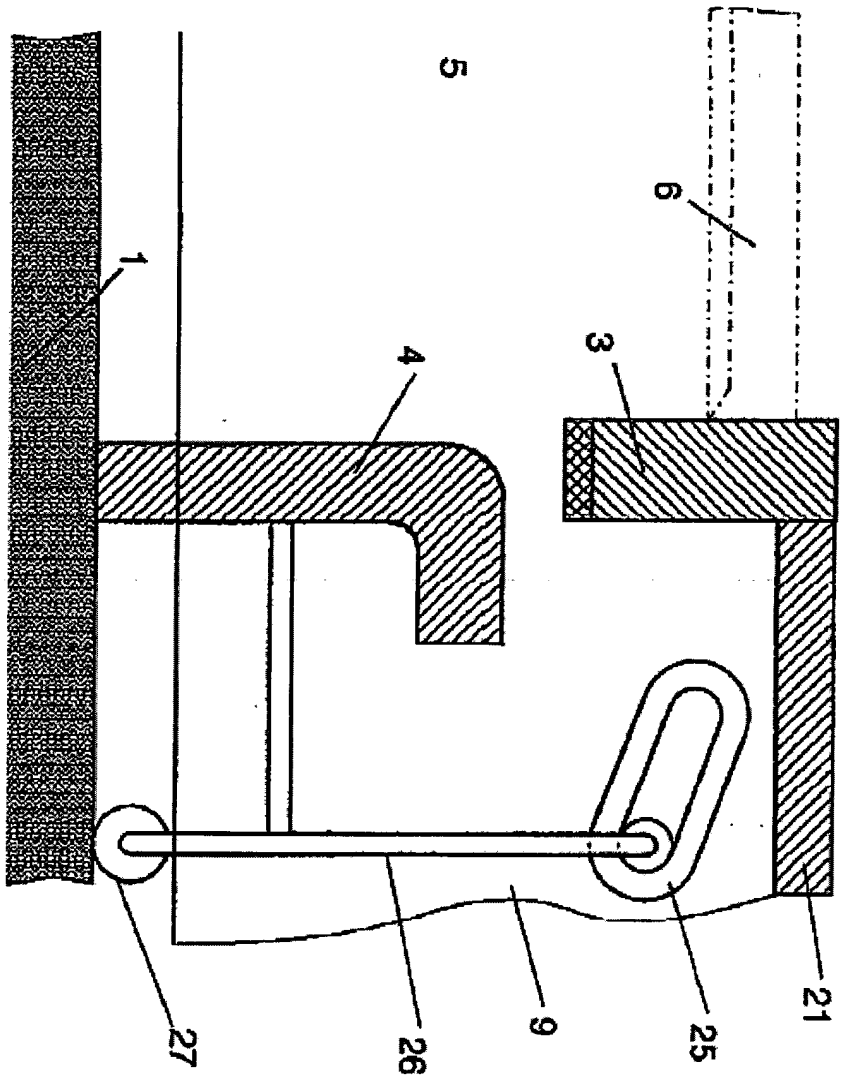

Fig. 13

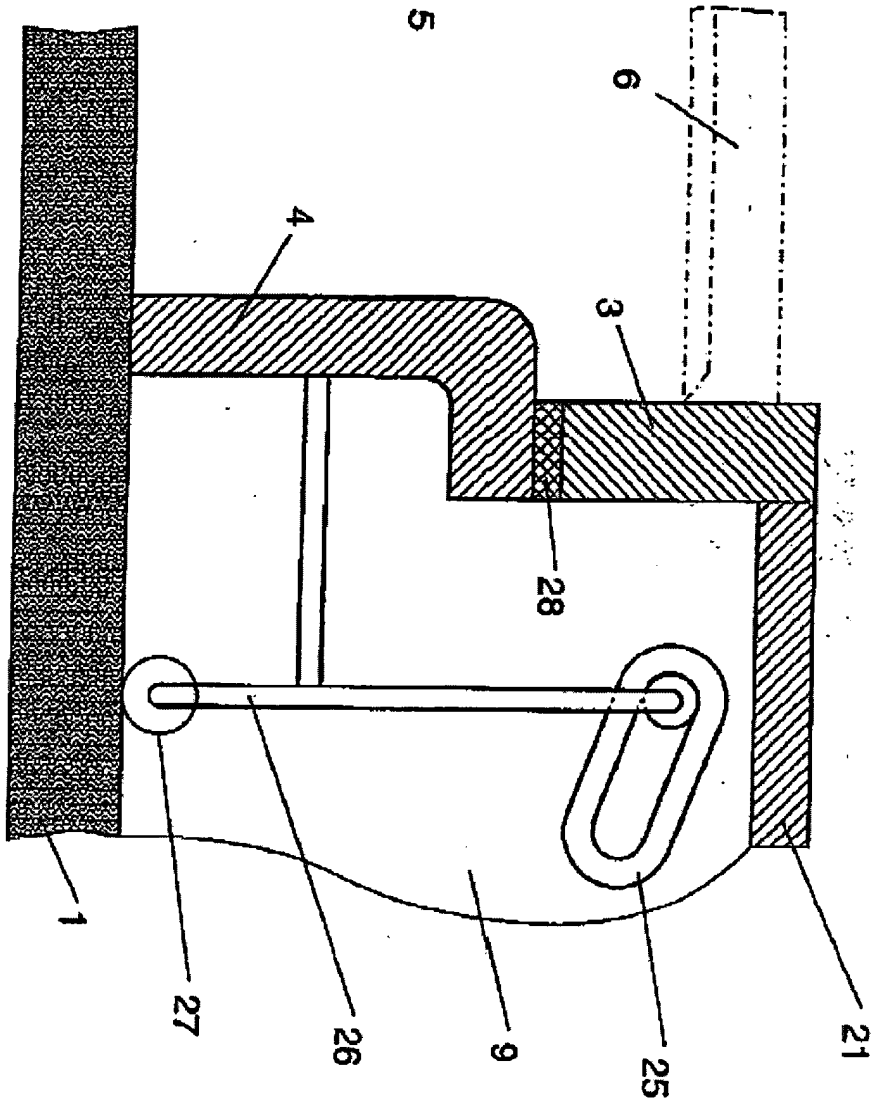

Fig. 14

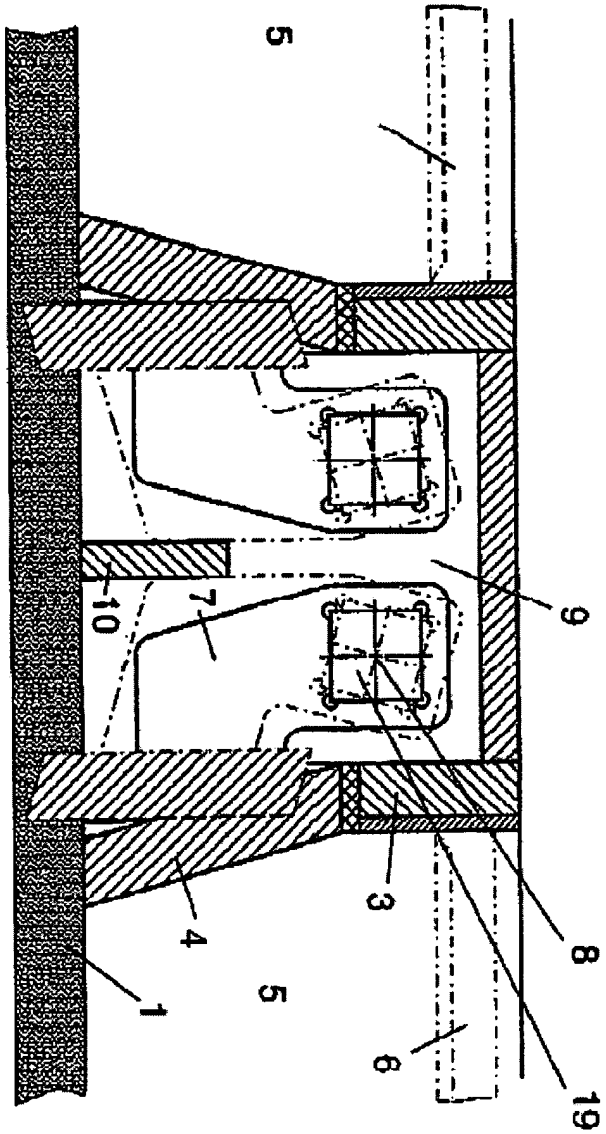

Fig.15

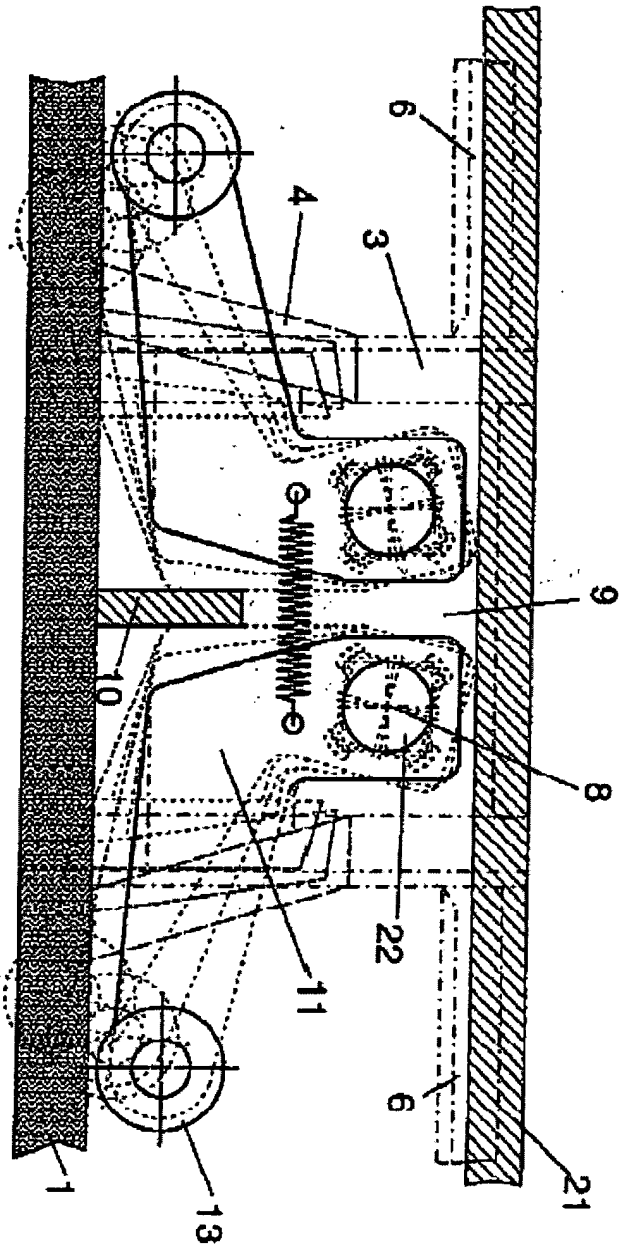

Fig. 16